

dependence, Ia., 17th, 6 to 8 a. m., severe hail storm. Cresco, Ia., 4th, 17th. Guttenburg, Ia., 4th, 25th. Nora Springs, Ia., 4th, 25th. Cedar Rapids, Ia., 4th, 12th, 25th. Holton, Kan., 26th. Yates Centre, Kan., 8th. Gardiner, Me., 10th, 30th. Falston, Md., 21st. Deer Park, Md., 15th. Fall River, Mass., 3d. Kalamazoo, Mich., 4th. Niles, Mich., 5th. Northport, Mich., 2d, 5.30, p. m., hail storm lasting five minutes, nearly covering the ground with stones as large as buck-shot. New Ulm, Minn., 16th. Corning, Mo., 26th, an excessive rain and hail storm visited the section of country about 20 miles north of this place. It is reported by the Atchison county papers that hail in some places drifted to depths of three and one half feet. Only the edge of the storm passed over this place. Protem, Mo., 31st, 3 a. m., heavy hail seven miles southeast of station, doing much injury to fruit trees and gardens. Lincoln, Neb., 26th. Freehold, N. J., 28th. Princeton, N. J., 9th. Fayetteville, N. C., 1st. Bellefontaine, O., 26th. Bethel, College Hill, Westerville and Wooster, Ohio, 27th. Jacksonburg, Ohio, 14th, 18th, 27th. New Athens, Ohio, 27th, 2.30 p. m., hail storm passed over station in an easterly direction. Twenty miles east of Wheeling, W. Va., considerable damage was done to windows. Dybury, Pa., 8th, 21st. Wellsboro, Pa., 9th, 18th. Meadville, Pa., 27th. Stateburg, S. C., 1st. Austin, Tenn., 17th, 28th. Murfreesboro, Tenn., 17th, 26th. Clarksville, Texas, 5th, 8th. Wytheville, Va., 15th. Franklin, Wis., 4th, 17th. Ft. Myer, Va., 8th. Castroville, Texas, 22d. Louisville, 27th. Logansport, Ind., 17th. Indianapolis, 15th. Milwaukee, 25th. Alpena, Mich., 15th. Burlington, Iowa, 7th, 8.15 p. m., hail as large as peas, lasting one minute. Des Moines, 14th, 17th. St. Paul, 4th, 20th. Madison, Wis., 4th. Davenport, Iowa, 17th. Fort Missoula, Mont., 16th, 17th. Deadwood, Dak., 26th. Fort Assinnaboine, Mont., 1st. Griffin, Tex., 6th, 8th. Ft. Cummings, N. M., 25th, 26th. San Carlos, Ariz., 26th. Tucson, Ariz., 25th, 26th. Silver City, N. M., 7th. Winnemucca, Nev., 15th. Dayton, Wash. Ty., 17th. Umatilla, Or., 18th. Colfax, Wash. Ty., 3d, 17th, 19th. San Francisco, 15th, 16th, 19th. Des Moines, Ia., 14th, hail lasting fourteen minutes. Murfreesboro, Tenn., 17th, a severe hail storm passed over Rutherford and Cannon counties about 7 a. m. The course of the storm was a little south of east. In some places in Rutherford county, hail fell to a depth of eight inches and the stones were unusually large.

SLEET.

The dates on which sleet fell in the various districts are as follows: New England, 1st, 4th, 5th, 6th, 10th, 11th, 18th, 19th, 21st, 26th, 27th; Middle Atlantic states, 8th, 9th, 15th, 17th, 18th, 19th, 21st, 22d, 27th; Ohio valley, 4th, 10th; upper lake region, 2d, 4th to 9th, 14th, 17th, 18th, 20th, 21st, 26th; Upper Mississippi valley, 8th, 9th, 10th, 13th, 14th, 20th, 23d, 25th; Missouri valley, 8th, 9th, 12th; southern slope, 5th to 9th; northern slope, 25th, 26th; middle plateau, 6th, 15th, 21st. Sleet was also reported from the following stations not included in the districts named above: Ft. Porter, N. Y., 21st; Ft. Stevenson, Dak., 14th; Ft. Supply, Ind. Ty., 7th; Umatilla, 18th. Unusually severe storms have been reported as follows: Coleman City, Tex., during sleet storm on 7th, 8th, ice on telegraph lines accumulated to the thickness of two inches; several iron poles were bent over by the weight and many trees broken. Graham, Tex., 5th to 8th, prostrating telegraph wire. Henrietta, Tex., 7th, ice on telegraph line one and a quarter inches thick; much damage done.

RELATIVE HUMIDITY.

The mean relative humidity for the month ranges as follows in the several districts:

New England, from 64 to 79; Middle Atlantic states, 58 to 79; South Atlantic states, 61 to 79; Florida peninsula, 69 to 72; East Gulf states, 66 to 78; West Gulf states, 57 to 83; Rio Grande valley, 71 to 84; Ohio valley and Tennessee, 60 to 71; lower lake region, 69 to 78; upper lake region, 73 to 80; extreme northwest, 69 to 90; Upper Mississippi valley, 62 to 75; Mis-

souri valley, 60 to 72; northern slope, 54 to 69; middle slope, 40 to 56; southern slope, 41 to 74; southern plateau, 36 to 51; middle plateau, 50 to 65; northern plateau, 60 to 79; North Pacific coast region, 74 to 78; Middle Pacific coast region, 62 to 79; South Pacific coast region, 37 to 72. High stations report the following percentages not corrected for altitude: Cheyenne, Wyo., 41.9; Pike's Peak, 81.0; Santa Fe, 37.3; Mt. Washington, 84.6.

WINDS.

The prevailing winds during the month of March at Signal Service stations are shown on chart ii. by arrows flying with the wind. On the New England and Middle Atlantic coasts and over lakes Ontario, Huron and Michigan the winds are northwesterly; in the South Atlantic states, southwesterly; in the Gulf states, Tennessee, Indian territory and northern Texas, southerly; in the Upper Mississippi and Lower Missouri valleys, northwesterly; in the plateau regions, variable, but mostly from south to west; in California, westerly to northwesterly; North Pacific coast region, southerly.

TOTAL MOVEMENTS OF THE AIR.

The following are the largest total movements at Signal Service stations: Mount Washington, 26,488 miles; Pike's Peak, 19,552; Delaware Breakwater, 14,345; New Shoreham, R. I., 13,887; Portsmouth, N. C., 13,686; Hatteras, N. C., 13,356; Kittyhawk, N. C., 12,840; Sandy Hook, 12,741; Champaign, Ill., 12,433; Sandusky, 12,314; Cape May, N. J., 11,807; Indianola, Tex., 11,616; Barnegat, N. J., 11,532; Huron, Dak., 11,300; Cape Henry, Va., 10,953; Milwaukee, 10,641; Macon, N. C., 10,447; Cheyenne, Wyo., 10,339; Moorhead, Minn., 10,215; Grand Haven, Mich., 10,182; Provincetown, Mass., 10,062; Dodge City, Kan., 10,031; St. Vincent, Minn., 10,009; Omaha, 10,002; Rochester, 9,938; Fort Shaw, Mont., 9,857; Fort Elliott, Tex., 9,839; Eastport, 9,794; North Platte, 9,495; Boston, 9,425; Fort Myer, Va., 9,258; Davenport, 8,960; Erie and St. Louis, 8,950; Alpena, Mich., 8,908; Bismarck, Dak., 8,887; Newport, R. I., 8,875; Buffalo, 8,811; Detroit, 8,800; Cleveland, 8,776; Fort Assinnaboine, Mont., 8,768; Galveston, 8,668; Springfield, Mo., 8,618; Eagle Rock, Idaho, 8,609; Fort Benton, Mont., 8,429; Columbus, O., 8,250; Port Eads, La., 8,248; Atlantic City, N. J., 8,190; New York city, 8,176; Springfield, Ill., 8,157; Louisville, 8,128; Smithville, N. C., 8,093; Oswego, 8,052; Toledo, 8,019; Fort Buford, Dak., 8,008; Umatilla, Or., 8,002. The smallest are: Roseburg, Or., 2,279; Uvalde, Tex., 2,732; La Mesilla, N. M., 2,757; Phoenix, Ariz., 2,848.

HIGH WINDS.

On the summit of Mount Washington, the maximum velocity, 118 miles, n.w., occurred on the 24th. Velocities of 75 miles per hour, or over, occurred as follows: 114 miles, s., 1st; 91, n.w., 4th; 100, s.w., 9th; 108, n.w., 20th; 90, n.w., 21st; 118, n.w., 24th; 75 n.w., 25th; 93, s.w., 27th; 92, s.w., 28th; 90, n.w., 31st. On all other dates during the month, velocities reached or exceeded 50 miles per hour, with the exception of 5th, 12th, 15th, 16th, 17th, 22d. On the summit of Pike's Peak, Col., the maximum velocity 92 miles, n., occurred on 20th. Other high velocities occurred as follows: 60, n.w., 1st; 60, s.w., 3d; 58, s.w., 4th; 58, s.w., 10th; 56, s.w., 11th; 58, s.w., 16th; 60, s.w., 17th; 50, s.w., 19th; 78, n., 21st; 62, s.w., 25th; 62, n.w., 28th; 66, n.w., 29th. Other stations reporting velocities of 50 miles per hour, or over, are as follows: Umatilla, Or., 52, w., 28th; Ft. Assinnaboine, Mont., 56, w., 28th; Ft. Benton, Mont., 50, w., 1st; Ft. Shaw, Mont., 51, s.w., 27th and 57, s.w., 28th; Helena, Mont., 56, s.w., 28th; Ft. Custer, Mont., 64, w., 28th; Ft. Keogh, Mont., 50, w., 28th; Cheyenne, Wyo., 52, n.w., 28th; Ft. Washakie, Wyo., 60, w., 28th; Huron, Dak., 50, n.w., 5th and 66, n.w., 20th; Palestine, Tex., 60, s., 18th; Indianola, Tex., 53, n., 21st; Rochester, N. Y., 50, n., 21st; Columbus, Ohio, 54, w., 21st; Champaign, Ill., 50, s.w., 9th; Del. Breakwater, Del., 52, s.e., 1st; Cape Henry, Va., 52, n.w., 13th; Kittyhawk, N. C., 50, n., 24th.

LOCAL STORMS.

Savannah, Ga., 28th, during the morning, a tornado passed through the counties of Effingham, Washington, Bibb and Randolph of this state. Its track was about half a mile wide, and it passed from west to east. Several lives were lost; trees, fences, houses and telegraph poles were blown down. Columbus, O., 21st, severest storm experienced for years, passed over city at 5 a. m. The wind continued to blow a gale all day; maximum velocity, 54 miles, w., was reached, at 5.15 p. m. A large number of buildings in course of construction, were damaged; out-houses, fences, signs, etc., were blown down. Cleveland, 9th, 8.35 p. m., during a severe storm, St. Mary's Catholic church was unroofed; a store on Broadway had its front blown in and considerable other damage of minor nature was done in the city; 27th, severe storm; between 12.30 and 1 p. m., rain fell torrents. A new frame building was blown over and crushed; another was moved two feet from its foundation; a frame store was also blown down; trees were uprooted, windows broken, and lumber piles were scattered. A high wall, the ruins of a recently burned building, was blown down, crushing through the roof of the adjoining building to the cellar and completely wrecking it. Sandusky, 27th, 9 p. m., heavy, inky clouds came up from northwest, accompanied by lightning and thunder. As the storm approached, it moved around to the northward and apparently only the edge of it touched the city. At Kelly's Island, much damage was done to a building in course of construction. Buffalo, 27th, severe storm reported from localities south of station; considerable damage was done.

St. Louis, 21st, one of the fiercest gales that has ever visited this city; the wind blew in violent puffs; maximum velocity 42 miles; very little damage was done.

Springfield, Ill., 21st; strong gale; a house in course of construction and nearly completed was entirely demolished; a few others were unroofed and many others were blown down.

Omaha, 20th, severe gale; several signs were torn from their fastenings; a wagon was upset in the street.

Fort. Washakie, Wyo., 28th, very severe gale; fences, out-houses, etc., were blown down; some new stables had roofs blown off. The Signal Service instrument shelter was badly damaged. This storm is considered by the inhabitants to have been the severest experienced for many years.

Fort Custer, Mont., 28th, gale from the west, maximum velocity 64 miles at 4.15 p. m. The sky was completely obscured by clouds of dust and pebbles. The west end of the post hospital was demolished and carried fifty yards. The porch of the barracks was thrown by the wind on the roof of the building; outhouses were overturned and fences blown down.

St. Meinrad, Ind., 27th, violent gale; many forest and fruit trees blown down.

Fort. Wayne, Ind., 20th, 10.30 to 11.30 p. m., severe storm; buildings, fences, etc., blown down.

St. Louis, Missouri Weather Service reports: at 3 p. m., on the 26th, a small tornado formed a short distance southwest of Hamansville, Polk county, and passed north of east through Elkton, Hickory county. Several houses were destroyed; no lives were lost, but in some cases severe injuries were inflicted.

New Haven, Conn., 4th, strong gale; trees, fences and signs blown down.

Monroe, La., 26th, violent hurricane, doing much damage; several gin-houses and cabins were destroyed; damage estimated at \$25,000; several negroes reported killed.

Reports from counties in southern Alabama and Georgia show that a violent and destructive tornado occurred in that section on the night of the 27th. In Butler county, Ala., some fifteen or twenty residences were either unroofed or entirely destroyed; a number of persons were more or less injured. The tornado passed through the upper part of Henry county between 9 and 10 o'clock. A farmer living in the track of the storm was instantly killed by the falling timbers of his house,

and his wife seriously, if not fatally injured. On this and other farms westward there was a total destruction of all the dwellings, gin-houses and engine works. In Dallas county, the storm was especially destructive. In a small place called Liberty Hill, every building is reported to have been destroyed, and a number of persons killed. On plantations lying east, south, and west of Selma, houses were blown to pieces, trees uprooted, fences blown down, and general destruction was caused by the terrific force of the wind. In East Selma a number of large buildings were demolished. In Black Creek bottom numerous trees were broken, their trunks being carried many feet, and the boughs taken up and deposited in fields hundreds of yards distant. In the East Selma cemeteries great damage was done to the monuments and shade trees; shrubbery and fences were laid low. In Barbour county, Ala., the track of the tornado was about a mile in width. It literally swept everything before it; trees, fences and houses—leaving them in utter ruin. In this county one man was killed and several were seriously injured. On one farm every house was blown away; on another all the buildings with the exception of the residence were destroyed. Many other farms suffered to a greater or less extent. A Methodist church at White Pond was torn to pieces, even the sills upon which it stood were removed. In Richards' settlement several lives were lost and many persons were injured. The baggage and passenger cars on the Clayton railroad were thrown from the track, and wrecked. The southwestern part of Lee county suffered considerable damage; many residences were completely destroyed; several lives were lost, and many persons were injured more or less seriously; one man was instantly killed. The tornado crossed the track of the Southwestern railroad within three-quarters of a mile of the town of Smithville, Ga. In this vicinity hundreds of tall and massive pines were uprooted, and fences in the neighborhood were leveled. On a plantation three cabins were entirely demolished while a fourth, distant about one hundred yards, remained intact. The dwelling on this place, a strongly built two-story frame structure, had the part facing the east together with attached sheds entirely demolished, while the front, though severely wrenched, remained standing. The owner of this dwelling, states that he noticed a great stillness and warmth in the atmosphere at 11 p. m. About half an hour later he heard a roaring, rushing sound, similar to that of several trains passing at full speed. In a few minutes vivid flashes of lightning followed each other in rapid succession; then large hail-stones began to fall; the roar increased; the house began swaying and in a few moments came down with a crash. The occupants narrowly escaped with their lives to a cabin about a hundred yards distant. At this time rain was falling in torrents, accompanied by such rapid flashes of lightning as to be almost continuous. The stock of the plantation was dispersed. A strong log hut about twenty yards northward of the dwelling was crushed, while a light frame structure about fifteen yards southeast was not harmed. A colored man on a neighboring plantation was killed by lightning. At this point the track of the tornado was about half a mile wide and its course a little north of east. Most of the trees blown down on the southern edge, lay about southeast and northwest, their tops pointing to the southeast; on the northern edge some were noticed to lay with tops to north and northwest and others just the reverse. It was also noticed that in some places the trees were twisted off and uprooted, pointing in every direction, some apparently sucked in, others blown outward. One observer claims to have witnessed the funnel shape of the roaring mass, and states that, by the aid of the incessant lightning, tree tops, planks, and debris could be seen whirling around at a great height; in places some tall trees within a short space of the immediate track had only their tops taken off, while in others trees were torn up by the roots. The path of the tornado clearly showed the bounding nature of the whirling mass and that it did not cling closely to the earth. Right in the track, a clump of trees, a line of fence,

or a house, would remain untouched, while to the east or west everything would be swept clean. In some places an upward and downward curve could be detected in its course; here a mass of trees were leveled to the ground, and there a cluster with only their tops broken off. Reports from Bulloch county show the tornado to have passed over a portion of that county, sweeping nearly everything in its path. At Sandersville, Ga., on the 27th, a tornado passed over the county about 11 a. m., causing much destruction. A number of persons were seriously injured by the blowing down of houses. A school house, at Whidden settlement, was blown down, the teacher and several children were injured. With the exception of the destruction of some fencing and shade trees, Sandersville escaped. At Raynesboro, Ga., 27th, a destructive wind swept over the county, four or five miles northeast of this place. Within the path of this storm a house was blown to pieces, killing one child. No other personal injury is reported, although houses are said to have been destroyed on every plantation within its course. All the public roads are seriously obstructed by fallen trees. Macon, Ga., 27th, a tornado did considerable damage to property near here, and along the railroad as far as Sandersville, dwellings, barns, gin-houses, cabins, and trees were destroyed. No fatal accidents are reported. The tornado was very violent and its track was about a thousand yards wide; it moved from west to east.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for March, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 86.66 per cent. The percentages for the four elements are: Weather, 81.91; Direction of the Wind, 83.33; Temperature, 90.46; Barometer, 90.86 per cent. By geographical districts they are: For New England, 86.56; Middle Atlantic states, 89.89; South Atlantic states, 86.36; East Gulf states, 83.77; West Gulf states, 81.92; Lower Lake region, 89.06; Upper Lake region, 88.59; Tennessee and the Ohio valley, 91.36; Upper Mississippi valley, 86.43; Lower Missouri valley, 80.48; Northern Pacific coast region, 81.94; Middle Pacific coast region, 93.14; Southern Pacific coast region, 93.14.

There were 88 omissions to predict (31 being due to the absence of reports from the Pacific coast) out of 3,813, or 2.30 per cent. Of the 3,725 predictions that have been made, 143, or 3.84 per cent., are considered to have entirely failed; 148, or 3.98 per cent., were one-fourth verified; 395, or 10.60 per cent., were one-half verified; 207, or 5.56 per cent., were three-fourths verified; 2,832, or 76.02 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

CAUTIONARY SIGNALS.

One hundred and seventy-four Cautionary signals were displayed during the month of March, of which 162, or 93 per cent., were justified by winds of twenty-five miles per hour, at, or within, 100 miles of the station. Sixty-four "Off-shore" signals were displayed, of which 55, or 86 per cent., were fully justified; 58, or 90 per cent., were justified as to direction; and 61, or 95 per cent., were justified as to velocity. Two hundred and thirty-eight signals of all kinds were displayed, of which 217, or 92 per cent., were justified. Twenty-five Cautionary signals were changed to "Off-shore" signals. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only. Twenty-nine signals were reported late.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on the right-hand of chart iii., are given the highest and lowest stages of water, as observed at Signal Service

stations, during the month of March. At stations on the Mississippi it will be seen that the water remains above the danger-line at Cairo and Vicksburg, and is only four inches below the danger-line at Memphis. The readings of the highest water during the month at stations on the lower Mississippi, were as follows:

Cairo, fifty-one ft., on the 1st, or eleven feet above the danger-line. Memphis, thirty-six ft., on the 6th, 7th, 9th. Vicksburg, forty-eight ft., nine ins., on 20th, or eight ft., nine ins., above the danger-line. The highest at New Orleans, occurred on the 27th, when it was but five inches below the high-water mark of 1874. The Red river was highest at Shreveport on the 10th, 11th, 12th, when it was thirty-one feet one inch, or one foot above the danger-line; it was lowest on the 31st. The Ohio river rose during the latter part of the month, but did not reach the danger-line; it was highest at Cincinnati on the 25th, at Louisville on the 26th, at Pittsburgh, on the 22d. The Cumberland was highest at Nashville on the 11th and 13th, when it was three feet nine inches above the danger-line. The upper Mississippi rose slowly during the month, between La Crosse and St. Louis, and was highest at Keokuk and Davenport on the 31st.

ICE IN RIVERS AND HARBORS.

Hudson River: Albany, 1st, ice broke up in river; 3d, river free of ice. First steamer of season left this city for New Baltimore, to-day; 5th, river free of ice from Troy to New York; navigation practically open for this season; 10th, first arrival by river from New York. New York City, 9th, navigation opened; first steamer from Troy arrived to-day.

Mohawk River: Albany, 1st, ice broke up in river and passed this city this evening.

Connecticut River: Springfield, Mass., 2d, floating ice in river. 3d, river clear of ice.

Genesee River: Rochester, 28th, first boat of season arrived to-day.

Detroit River: Detroit, 2d, ice along shore in river; 13th, steamer "City of Detroit," left for Cleveland; first departure of season.

Lake Erie: Buffalo, 26th, the propeller "New York," arrived from Cleveland; the earliest arrival for many years.

St. Lawrence River: Cape Vincent, N. Y., 3d, ice breaking up and going out of river and lake at this place.

Lake Superior: Marquette, 3d, ice moved out of harbor; 4th, ice moved back into harbor. Duluth, Minn., 1st, all ice went out into the lake during the night; 4th, ice driven back during the evening; 5th, lake filled with ice; 10th, ice moved out about one-fourth mile; 18th, ice moved out about one-half mile; navigation resumed; tugs with freight and passengers left for northern ports; 20th, ice driven back again, damaging the old breakwater.

Lake Michigan: Milwaukee, 8th, navigation practically open. Northport, 31st, no ice to be seen in lake; navigation fairly open.

Manitowoc River: Manitowoc, Wis., 4th, ice broke in river; 7th, river frozen; 15th, river open.

Lake Huron: Alpena, 2d, ice broken in bay and river; navigation open. Port Huron, 23d, steamer "Flora," left city this a. m. for northern ports; the earliest departure for years.

Yellowstone River: Fort Buford, Dak., 29th, ice broke in river at 10 p. m. Fort Keogh, Mont., 28th, river open. Terry's Landing, 25th, river open; 26th, ice gorged in shallow places. Foley, Montana, 28th, ice broke in river during night. Iron Butte, 29th, ice broke in Upper Yellowstone to day, sweeping out about 100 feet of Northern Pacific Dyke.

Mississippi River: Burlington, 4th, navigation opened; first boat of season passed city at 5.45 p. m.; 11th, first passenger steamer from St. Louis touched this city on her upward trip to La Crosse. Keokuk, 6th, navigation open; first raft of season passed to-day; 18th, first northward bound steamer passed to-day. La Crosse, 3d, river opened; 4th, navigation resumed; steamer arrived from Fountain City; ferry boats making regu-